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Copra Crops and Cost of Production in Malaya.

H. W. Jack.

Various opinions are frequently expressed regarding the normal production of copra per acre from coconut estates in Malaya so that the following figures may be of interest.

The figures have been collected annually from mature areas from thirty representative estates, all of which are under European management and the area from which the figures are derived is approximately 50,000 acres.

Year.	Average yield of copra per acre per annum in pikuls.*	Average number of nuts produced per acre per annum.	Average number of nuts per palm.	Average number of nuts per pikul of copra.
1921	8.51	2018	42	237
1922	8.75	2222	46	254
1923	8.06	1971	41	245
1924	8.71	2097	44	241
1925	8.69	2152	45	248
1926	9.77	2614	54	268
1927	8.65	2258	47	261
Means.	8.734	2190	45.6	251

*1 pikul = 133⅓ lbs.

The above figures show that the production of copra in Malaya is steady from year to year with the exception of 1926 which was an unusually good year in several districts, when some estates showed averages around 14.00 pikuls. Seasonal variation is marked in the records from which the above figures are compiled but it is noticeable that different districts are affected differently in the same season so that the average yield of copra per acre remains fairly constant when viewed "in toto."

The trend of production shows a slight increase. This may be seen by comparing the average yield of the first 3 years (1921—23) with the average of the three later normal years 1924—25 and 1927 (omitting the abnormal year 1926). The average of the first period is 8.44 pikuls whereas the average of the later normal years is 8.68 pikuls. This slight increase would probably be accounted for by the increase in maturity of the palms which are still young as judged by the life of a coconut palm since the oldest palms included in the data have only been planted some 28 years.

The general constancy of yield is also apparent in dealing with the number of nuts collected per acre per annum except in 1926 when the crops were unusually heavy. The total average yield of nuts per palm is 45.6 which should be capable of considerable increase under good management since the best estates average round about 60 nuts per palm over a period of several years, though, of course, all estates are not equally fortunate in their general suitability (soil, water table etc.) for copra production.

The highest recorded average yield per palm over a large area (800 acres) was 90 nuts in the year 1926 while in the same year the lowest record was 34 nuts. In the normal years the highest and lowest records were respectively 75 and 25 nuts per palm; the latter figure could hardly have been remunerative. As regards the average number of nuts required to produce one pikul of copra, the tendency is towards an increase and it is notable that in the best production year (1926) this figure was considerably higher than in all other years. The tendency for nuts to become smaller as the palms advance in years is commonly recognised in Malaya and may be a normal consequence of age but is more likely due to lack of cultivation for few estates in this country adopt any regular cultural methods with this crop; moreover, palms under 30 years of age can hardly be said to be old except

where environmental conditions are unfavourable and 90% of the palms from which the figures are derived are only around 20 years planted.

Improved cultivation coupled with manuring should substantially increase the size of the nuts and the consequent production of copra per acre, and at the same time reduce working costs.

Costs of Production.

The costs of production of copra on European managed estates vary considerably for every operation as can be seen from the following table which shows the average figures collected from sixteen representative estates during 1927.

Copra Production Costs.

Averages from figures collected from 16 representative estates.

1.	Capital cost per acre ...	$389.00
2.	F.O.B. cost per pikul ...	5.62
3.	Nut picking and collection per 1,000 nuts ...	1.18
4.	Husking per 1,000 nuts ...	.53
5.	Splitting per 1,000 nuts ...	.34
6.	Meat extraction per 1,000 nuts ...	.41
7.	Contract rate for 4, 5 & 6 ...	1.31
8.	Husking to meat extraction per pikul of copra	.35
9.	Curing per 1,000 nuts ...	.86
10.	Curing per pikul of copra ...	.32
11.	Contract husking to copra production per 1,000 nuts ...	1.55
12.	Contract husking to copra production per pikul	.46
13.	Cost of bags	28—67 cents.
14.	Transport to ports per pikul	4—38 cents.
15.	Drainage upkeep per acre ...	2.57
16.	Weeding and cultivation per acre per annum...	12.03
17.	General charges per pikul of copra ...	2.49

The above figures scarcely require comment but a few notes may add interest. Regarding capital cost per acre the extreme figures recorded were $220.00 and $650.00 but the majority of the estates showed figures approximating the

above mentioned mean of $389.00. The F.O.B. costs per pikul appear suprisingly high but seven estates exceeded the mean figure and four showed a figure of over $7.00. This should give estate managers cause to think, for their working organisations must surely be at fault and a good figure at which to aim should be about $4.50 though several estates show figures even less than this—the best being $3.35.

The cost of nut picking and collection naturally varies with the abundance of the crops and possibly the height of the palms as well as with the methods employed and the variation recorded ranged from 61 cents per 1,000 nuts to $1.55. The cost of husking did not show much variation the limits being 45 cents and 70 cents.

Splitting varied from 28 cents to 51 cents and meat extraction ranged from 18 to 70 cents, though it must be pointed out in this connection that some estates partially dried the meat before extracting it when, of course, the half dried meat practically falls out, hence the low figure of 18 cents.

The contract rate for husking, splitting and meat extraction varied from $1.01 per 1,000 nuts to $1.56 and the same operation per pikul of copra cost 35 cents almost uniformly on all estates. The cost of curing per 1,000 nuts varied greatly showing a range of from 11 cents to $2.06 while the cost per pikul ranged from 3 cents to 47 cents. The contract rate for all operations from husking to copra varied from $1.25 to $1.90 per 1,000 nuts or from 36 to 67 cents per pikul of copra. Cost of bags varied a good deal depending on the quality of bag used and whether the copra was being sold locally or in Europe, while the cost of transport to the ports naturally varied according to location and to the transport facilities of the different estates.

The cost of drainage upkeep varied from $1.50 to $5.74 probably depending on the texture of the soil and the depth of the drains.

Cultivation, including weeding, varied considerably, the lowest and highest figures being $4.20 per acre per annum and $26.35 respectively. On many estates cultivation as such was not practised the operation being more or less limited to weeding whereas on some estates thorough tillage was given to the soil, in some cases by tractor, and hence the wide divergence in the figures. It is notable that tractor cultivation cost considerably less than the average for cultivation,

though the figure quoted may not include allowance for capital cost and depreciation of machinery.

The general charges per pikul of copra varied from $1.13 to $4.09 though most estates approach the average price of $2.45.

These rates are merely a compilation of figures derived from a number of estates and show general average costs which must vary according to location of individual estates, according to the routine followed, the methods adopted in different operations, the skill and ability of the supervision, the health of the neighbourhood, the nature of the buildings and many other factors, but they should be of interest to coconut estate managers and agencies as giving comparative figures on which to base standards and may therefore serve a useful purpose.

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Soil Analyses and Their Limitations.

W. N. C. Belgrave.

In the course of a recent Conference held in Ceylon two authorities strongly expressed the opinion that soil analyses were useless as a guide to manuring of tea-plants; from the context it seems clear that there is still a certain demand for such analyses from tea planters. As there is also a fairly steady demand for soil analyses from planters in Malaya it seems possible that a short discussion of the benefits to be derived from such analyses may be useful. Further, there have been in recent years changes in the methods of expressing results which need explanation.

An analysis of a soil submitted by a planter has always to assist in answering one of two questions:—

(i) Is this soil suitable for a given crop, or conversely, what crop is suited to this soil?

(ii) Assuming the soil to be suited to the crop, what soil treatment, if any, is necessary to enable optimum results to be attained? Such treatment may be mechanical—tillage or drainage, or chemical—manuring, or both.

It is proposed briefly to review the older well known standard methods, then to discuss the limitations to the usefulness of such methods and recent modifications, lastly to explain the present sphere of usefulness of soil analyses.

Methods of Analysis.

All methods used fall into one of two groups—physical or chemical.

(a) *Physical Analysis* deals with properties of the soil such as tenacity, permeability to air and water and water retention. The commonest form of physical analysis is the "mechanical", in which soil particles are separated into classes according to size and the quantities present in each class determined. The classes are "stones", "gravel", "sand",

"silt" and "clay", with until very recently, a number of subdivisions varying from country to country. The larger particles are separated by sieving—the smaller by sedimentation in water after treatment with appropriate chemicals and vigorous shaking.

Determinations until very recently were also made of "loss on ignition", i.e. loss of weight on heating dry soil to low redness and this figure was supposed to give a measure of organic matter (plant and animal remains) in the soil. The various fractions were "ignited" before weighing.

(b) *Chemical Analysis* aims at finding the amount of nutrient substances in the soil at the disposal of the plant roots. The nutrients which are likely to be deficient are nitrogen, potash, phosphorus and, less frequently, calcium.

Nitrogen is determined by heating the whole soil with strong sulphuric acid until all is converted into ammonia, and the latter is then estimated—the other nutrients are extracted by solvents before estimation.

For 'total'* mineral nutrients strong hot hydrochloric acid is emloyed and the quantity extracted is conventionally assumed to be that which in the course of time will ultimately become of use to the plant.

For 'available' nutrients, cold dilute (1%) citric acid solution is employed, and is supposed to give a measure of the quantity of nutrient immediately available for the use of plants.

In addition before 1916 determinations of "lime requirement" were frequently made. The figure found was taken to indicate the amount of lime necessary to ensure good growth of crops on the soil under consideration.

Limitations of the Standard Methods and Recent Modifications.

Physical Analyses.

There is one obvious limitation to the application of the results of mechanical analyses, namely, the fact that such analyses take no account of the field structure of the soils.

* The term ' total' although customary is misleading since there may be considerably more of the nutrient substances present than is extracted even by hot strong acids.

No soil in the field exists in the state of ultimate particles, but always these particles are aggregated into 'crumbs' even after the most thorough tillage, yet the standard mechanical analysis takes no account of such 'crumbs'. How serious this may be, can be made clear by considering two adjacent fields both of heavy clay, belonging to two farmers, one in good condition through careful treatment, the other puddled and spoilt by years of unskilful treatment. Both of these fields would give exactly similar mechanical analyses.

Numerous methods have been proposed for remedying this defect, especially in Central Europe; in some the preliminary treatment of the soil is far less violent than in the standard method—the idea being to break down only as far as the finer aggregates. It is clear, however, that we have here an equally arbitrary fixing of limits of disintegration.

Other methods of arriving at field structure are these in which the rate of penetration of water in the soil in situ is determined and those in which the volume weight of the soil in situ are determined. Field structure at any one time clearly loses in importance as the intensity of tillage increases, and probably for that reason analysis by the standard method has found favour, in spite of its limitations, in Western Europe and America rather than the modifications described above.

A number of workers have directed attention to determinations of permeability, swelling and contraction, plasticity, tenacity, etc., but none has yet come into general use—all suffer from the inherent defect that the soil is studied under artificial conditions; and it does not seem that they will in the near future replace the standard mechanical analysis, although they may supplement it.

Leaving aside this inherent limitation of mechanical analysis there is another less obvious limitation which comes particularly into play in the Tropics, viz. the chemical composition of the 'clay' fraction.

'Clay' in this connection is simply a conventional term for particles below a certain size; and to these very fine particles the soil owes the properties of tenacity, plasticity, etc.,—it happens that in England the clays of practically all soils have the same composition (they are in essence silicates of aluminium) and the same 'clay-like' properties, i.e., extreme

stickiness, etc. As one comes into hot humid regions, however, laterite soils are encountered and instead of pure aluminium silicates we have the fine particles consisting of iron and aluminium hydrates or oxides with aluminium silicates—until in extreme cases of pure laterites there may practically no silicate at all—yet in analyses all such fine particles are returned as 'clays', although the mechanical properties of the lateritic 'clays' differ widely from those of the silicate 'clays'—they are less tenacious, less plastic, etc.—hence two soils belonging to the two different types may analyse the same and yet exhibit totally different properties. For a reliable forecast, either the composition of the clay must be determined or the soil 'type' must be known.

The question of the composition of 'clay' reacts also upon the so-called 'organic matter' determined by 'loss on ignition'. It has always been recognised that some of this loss is due to so-called 'water of hydration, i.e. water chemically bound in the soil and not driven off by preliminary heating to 100—105°C. Practically all of this water is held by the fine fractions and the amount so held by silicate clays happens to be low, but lateritic 'clays' bind considerable amounts of water—up to 30%, therefore loss on ignition figures are quite unreliable as general guides to organic matter in tropical soils. Very large losses on ignition of course show considerable organic matter, but casual inspection of such soils will reveal the same thing.

There has recently been added yet one more pitfall for the unwary. International agreement has at long last been reached for methods of mechanical analysis, and the limits of size for the various fractions have been considerably changed, the 'clay' now embracing some of the former 'silt', in addition the practice of igniting fractions before weighing has been abandoned.

Both these changes tend to increase the recorded 'clay' by varying amounts, as a result analyses made prior to 1928 are no longer directly comparable with those now carried out; adjustments having to be made by calculation.

After having noted all these obstacles to an accurate forecast it remains true however that in general mechanical analyses provide the most reliable rough guides to general soil properties.

Chemical Analyses—(a) Nutrients.

We are here on quite different ground—while an elementary acquaintance with the range of habitats and soils on which any plant grows, will suffice for the application of the results of mechanical analysis—the correct application of chemical analyses demands such an exhaustive knowledge of the response of the plant to manuring on different soil types that it is safe to say with the Ceylon authorities that chemical analyses *per se* are useless.

The reason for this trouble with chemical analysis is easily found—although dealing with very small amounts of nutrients, in some cases one-hundredth of 1%, we attempt to replace the plant root or root hair with its large range of adaptability and equally large variation from crop to crop, by a uniform and brutal method of extraction by acids. It would be about as reasonable to expect an accurate determination of the water requirements of men by determining the water vapour in the atmosphere of their environment, neglecting essential factors of the human machine such as the response of the sweat mechanism to temperature.

Recognition of difficulties have led to numerous attempts to vary the solvents but without any noticeable success—especially with tropical soils.

In any case even for the crudest application of chemical analyses the mechanical analyses must be known, since the quantity of nutrient necessary for satisfactory plant growth varies with soil texture, increasing as the clay increases.

(b) Lime Requirement and Soil Acidity.

It is now agreed that the old standard method of estimating lime requirement by boiling with baryta, an alkali, was too drastic and that milder methods are preferable. Experience had shown that temperate arable soils with an appreciable lime requirement derived benefit from liming in quantity roughly approximating to the figures analytically determined. Unfortunately, attempts were made to transfer this experience to the tropics without due appreciation of the differences involved. Nearly all Malayan soils show very high lime requirement, some of the earlier determination indicating up to 4 tons per acre of quicklime for moderately heavy alluvial clays.

The misleading nature of these figures was speedily demonstrated by experiment, and the writer would strongly urge Malayan planters not to waste money on indiscriminate liming which quite probably will produce no effect whatever, especially on inland soils carrying permanent crops .

Even in temperate countries lime requirement determinations appear to be falling into disfavour, and greater use is being made of direct determinations of soil acidity, most often expressed in terms of pH. The derivation of the pH scale is somewhat complex, but it suffices to remember that pH 7 is approximately the true neutral point, pH 6 is so faintly acid as for practical purposes to be neutral, pH 5 is moderately acid, pH 4 is strongly acid and pH 3 is at or beyond the limit of plant growth. In temperate climates it is often possible by determining the acidity (or pH value) of a soil suspension in water to determine whether the soil does or not require liming to grow particular crops. No more, however, than by the determination of lime requirement, does it seem possible bodily to transplant temperate experience to the tropics. Malayan soils* range from pH 4 to 4.5 for most peaty soils and from 4.7 to 5.5 for inland mineral soils, yet as pointed out above it is doubtful whether the latter at any rate respond to applications of lime.

The Legitimate Sphere of Chemical Soil Analyses.

From the foregoing it will have been gathered that while the writer considers mechanical analyses to be useful, chemical analyses in themselves cannot be recommended. There is, however, a perfectly legitimate sphere in which chemical analysis can be of use, and this is for comparing a soil with another of the same type and in the same habitat of which the reaction to manures for the crop under consideration has been ascertained, either by long planting experience or by specially arranged field experiments. When and only when this basic information is available can use be made of chemical analysis. It must clearly be understood that the qualification 'in the same habitat' is essential, comparison from country to country or even from one part of the same country to another may be highly misleading owing to climatic differences, even when both mechanical and chemical analyses agree. It is for example, established that phosphatic manures will tide some crops over excessively dry spells, and under such conditions a response to manuring may be obtained

*Determinations carried out on suspensions.

which will be entirely lacking on exactly similar soils in countries with more uniformly distributed rainfall.

Practical Considerations.

Having set forth the considerable limitations to the utility of soil analyses it is legitimate to enquire what should be the attitude of a Malayan planter to such analyses.

It has been indicated that mechanical analyses are of distinct utility, this is especially the case where large tracts under heavy vegetation or of a swampy nature are being considered.

Where growth of existing crops is very poor, a chemical analysis may reveal some unfavourable compound in the soil, this, however, is a matter of special consultation with the Department of Agriculture and not of routine analysis.

There is in the writer's opinion at the present time no experience in Malaya which would justify expenditure on routine chemical analyses. To acquire the necessary experience manurial and cultural experiments will have to be carried out with permanent and non-permanent crops on all of our different soil types in different localities. Until such experience is available planters are advised to lay out small scale experiments (of a few acres each) and observe them for a few years before embarking on expensive liming or manurial programmes over large areas. Advice on the lay-out of such experiments will gladly be given by the Department of Agriculture.

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Oil from Aleurites Montana.

C. D. V. Georgi and Gunn Lay Teik.

Introductory.

A small consignment of seeds of *Aleurites montana*, was received recently from the Government Experimental Plantation, Serdang, where a small area has been planted with seed obtained originally through the Botanical and Forestry Department, Hong Kong.

The trees are approximately 3 years old and the present sample of seeds forms part of the first crop. So far the trees have not shown vigorous growth, probably due to unsuitable climatic conditions, since this species of *Aleurites* requires a sub-tropical climate, being indigenous to South-east China.

The oil from *Aleurites montana* is sold as Chinese wood oil or Chinese Tung oil, although the greater part of the Chinese wood oil of commerce is obtained from another species of *Aleurites*, namely *A. Fordii*.

Aleurites Fordii is found only in the temperate parts of China and trials carried out at the Experimental Plantation, Kuala Lumpur, have proved that this tree is quite unsuited to the tropical conditions of Malaya.

Although a botanical description of *Aleurites montana* has already been published in this Journal, compare "Candlenut and Chinese Wood Oil Trees", W. N. Sands, Vol. XII, January, 1924, No. 1, page 1, the oil has not previously been investigated in this Department. It was considered advisable therefore to determine both the oil content of the seeds and the more important analytical constants of the oil in order to obtain data for comparison with the standards for Chinese wood oil.

Neither of these two varieties of *Aleurites* should be confused with *Aleurites triloba* (syn. *A. moluccana*), a tree indigenous to Malaya and from the seeds of which candlenut oil is obtained. A short account of the differences between Chinese wood oil and candlenut oil has already been given

in this Journal, compare "Chinese Wood Oil and Candlenut Oil", B. J. Eaton and C. D. V. Georgi, Vol. XIV, November, 1926, No. 11, page 338.

Oil Content of Seed.

The following results were obtained on analysis:—

Average weight of seed		2.8 grammes.
		per cent.
Proportion of shell	...	47.2
Proportion of kernel	...	52.8
Kernel.		
Moisture (loss at 100°C.)	...	5.4
Oil (petroleum ether extract)	...	43.2
Residue (by difference)	...	51.4
Oil (calculated on moisture-free basis)		45.7
Seed.		
Oil (calculated on whole seed)	...	22.8

Analytical Constants of Oil.

The kernels were shredded, warmed and pressed in a small hand-press, the crude oil being filtered to remove traces of suspended matter.

The oil was clear, pale yellow in colour and had a slightly sweetish odour.

The average results of duplicate determinations are shown in the following table, average figures for Chinese wood oil and candlenut oil being added for purposes of comparison. The figures for Chinese wood oil are taken from "Chemical Technology and Analysis of Oils, Fats and Waxes", Lewkowitsch and Warburton, Vols. I & II, those for candlenut oil from the results of a previous investigation carried out in the Department, compare "Oil from Aleurites Species", C. D. V. Georgi, Vol. X, July, 1922, No. 7, page 202.

Constant.	Present sample.	Chinese wood oil.	Candlenut oil.
Oil.			
Specific gravity at 15.5°C.	0.939	0.935—0.940	0.929
Refractive index at 20°C.	1.5098	1.5179	1.4773
Saponification value ...	195.5	193.0	193.3
Iodine value (Wijs) ...	160.3	170.6	149.0
Acidity (Oleic Acid per cent.) ...	1.8		2.3
Unsaponifiable (per cent.)	0.6		
Fatty Acids.			
Solidifying point (Titer value) ...	36.8°C.	37.2°C.	12.5°C.
Mean molecular weight ...	298.4	297.1	282.4
Neutralisation value ...	188.0	188.8	198.7
Iodine value (Wijs) ...	164.7	144—159	

Remarks and Conclusions.

The results indicate that the physical and chemical constants of oil from *Aleurites montana* agree closely with those for Chinese wood oil, except for a small difference in the iodine value but that there are marked differences when a comparison is made with candlenut oil.

Although the iodine value of the oil from *A. montana* is less than that of Chinese wood oil, the figure quoted for latter oil, 170.6, is slightly in excess of the maximum figure found in commercial specifications of this oil in which the usual limits are 155—170. The difference is of little consequence and may be due possibly to the changed climatic conditions under which the trees are being cultivated.

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The Agricultural Trade of Malaya for the First Half Year 1928.

D. H. Grist.

The following examination of the agricultural trade of Malaya is based on the monthly returns of Foreign Imports and Exports of British Malaya, compiled by the Department of Trades and Customs.

One has to remember that there is in Singapore, a very considerable trade in the agricultural products of the Netherlands East Indies. Some of these products are merely re-exported, but many of them receive treatment before re-export, either by manufacture or grading.

The trend of agricultural trade during the first half year of 1928 shews no marked improvement over that of the corresponding period in 1927. The present résumé of the position deals with the agricultural products of tropical countries, and therefore presumably capable of production in Malaya. The economic production of these crops in this country is in many cases open to question, although undoubtedly many of these products might with advantage be produced in greater quantities in the Malay Peninsula.

Foodstuffs.—The chief of these products are rice, tapioca, sago and pineapples. The returns of the Imports and Exports for the first six months reveal the fact that the net imports of rice was 250,000 tons, being a decrease of 6,000 tons, the rice bill costing one million dollars less than that of the first half year 1927. Possibly this apparent saving will be counterbalanced later in the year by heavier imports.

Malaya is a producer of tapioca and sago and is able to export considerable quantities. The net exports have however dropped from 18,000 tons to 14,000 shewing a decrease in trade values of approximately $125,000. The total value of these net exports, however, remains at the comparatively high figure of over two and a half million dollars.

The exports of canned pineapples during the period was 26,227 tons, valued at four and three quarter million dollars,

being an increase of over six and a half thousand tons and half a million dollars. This satisfactory increase has been brought about by adjustment of local difficulties and improved conditions in the United Kingdom.

Oil and Oil bearing products.—The importance of oil bearing products in Malaya is perhaps less appreciated than they deserve. They consist of copra and coconut oil, ground nuts and kachang oil, palm oil and palm kernel and castor oil.

	Net exports 1st half year 1928.		Increase + or Decrease – Over 1st half year 1927.	
	Tons	Value $	Tons.	Value $
Copra -	33,726	6,888,939	–9,588	–1,322,903
Coconut oil -	5,189	1,727,196	+1	–58,366
Palm oil -	448	119,485	+106	+3,651
Palm kernels	82	8,435	+24	+2,679

	Excess imports over exports 1st half year 1928.		Increase + or Decrease – of excess imports over 1st half year 1927.	
	Tons	Value $	Tons.	Value $
Groundnuts -	4,110	1,747,906	–42	+1,068,256
Kachang oil -	117,436 (cwt.)	2,523,211	+12,557 cwt.	+4303,436
Castor oil -	780 (cwt.)	9,650	–19 cwt.	+5,489

From the above tables it will be noticed that the copra exports (and therefore presumably production) have decreased by nearly 10,000 tons, while coconut oil exports remain stationary with a decrease in values. The bill for groundnuts and kachang oil has increased very considerably, the total value under this head being about half the value of the exports of coconut products.

Palm oil and kernels shew normal increases due to new areas coming into bearing. Castor oil, mainly employed as a lubricant, shews a small increase. The market for this commodity however, is likely to increase.

Beverages.—Tea and coffee remain large items of expenditure. The country spent 2½ million dollars on these two

items being a decrease of $300,000, over the first half of 1927. The increased area being planted with coffee, and the growing interest in local tea production should bring about a further narrowing of the difference between imports and exports of beverages.

Miscellaneous Products.—The net production of Arecanuts amounted to nearly 13,000 tons, valued at approximately $2,700,000 being an increase of 778 tons and a decrease of $35,000 in value. This is accounted for by a bad season giving an advantage to the produce of India and Ceylon.

Gambier.—The production of block gambier decreased by 372 tons to 163 tons, valued at approximately $24,000. Cube gambier increased by about the same amount to 1431 tons, valued at $272,000. This commodity shews little likelihood of an early recovery.

The production of pepper would appear to be very remunerative at present prices. Although production decreased by over 2,000 tons, valued at nearly $3,500,000, the net exports of this product were valued at nearly five million dollars.

The aggregate value of the exports of the agricultural products of Malaya (other than rubber) during the first half year 1928 was approximately $24,700,000, being an increase of rather more than two millions over the corresponding period of 1927.

The total value of agricultural products of which imports exceed exports over the same period was valued at rather more than $38,600,000, being almost exactly the same figure as the corresponding period of the previous year.

It is desirable that the country should be self supporting in the matter of foodstuffs, or if that is impossible, that the exports of foodstuffs should at least approximate to the imports of other foodstuffs. The above figures indicate that nearly forty million dollars worth of tropical foodstuffs are imported as against twenty-four million dollars worth of exports of a similar nature in a period of six months.

The picture of the agricultural trade of Malaya would be incomplete without reference to rubber. As is well known, there has been a considerable decline in value of exports during the present year. In round figures, the exports for the first

half of 1928 were valued at one hundred million dollars, being a drop of 50% over the first half of 1927. Such fluctuations as this react favourably on other forms of agricultural enterprise. Increased interest is evinced in oil palms, coconuts, pineapples, coffee and tea. It might be added that there are other crops worthy as consideration as plantation industries, for instance arecanuts. The future holds promise of a greatly increased production of palm oil products. The present decreased production of coconut products is due largely to exceptional seasons; taking a long view of the industry it is believed that the crop will prove more remunerative by reason of improved methods of cultivation and more careful selection of seed. Generally speaking, it is expected that the second half year 1928 will shew increased production of the more important crops in Malaya, and will compare more favourably with the corresponding period of 1927, than does the period covered by the present review.

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Copra and Coconut Oil

BY

KATHARINE SNODGRASS.

*Published by the Food Research Institute of Stanford University, California.**

This book is the second of a series dealing with fats and oils. The first, published in February of this year, on "The Fats and Oils: A General View", has not come to the present reviewer's notice. The other works in this series are in course of preparation.

For those engaged in copra production in Malaya, "Copra and Coconut Oil" will prove of great interest, for the Authoress has condensed into 135 pages a mass of statistical and other information, and has dealt in some detail with the principal sources of production. Emphasis is laid on the large and growing American market for these products, and the book is, of course, written from the American point of view, with special reference to The Philippine Islands—the second largest source of coconut oil and copra.

The interest of the American market on the subject of copra production is revealed in the first chapter, in which it is stated that, whereas in 1910 coconut oil was practically unknown in America, yet sixteen years later the consumption in that country was nearly 45,000 tons of coconut oil. Furthermore, it is anticipated that as the demand for margarine and soap—for which coconut oil is mainly employed—is increasing, even larger quantities of copra will be required by that country in the future.

One of the most interesting chapters is that dealing with "International Trade: its Volume and Course". The Dutch and British each control about one-third of the copra trade. There has, of recent years, been a considerable expansion of this trade, due principally to that under British control.

* European Sales Agents in Great Britain: P. S. King & Son, Ltd., Orchard House, 14 Great Smith Street, Westminster, S. W. 1. London: but unfortunately no information is given in the book regarding sale price.

Statistics shew that since the war, Rotterdam and Hull have improved their transhipment market for this commodity at the expense of Marseilles and Hamburg. Germany remains the principal importer as she was before the war. The Netherlands comes second, the United States third, and France fourth; whereas before the war, France was second, the Netherlands third, and the United Kingdom fourth.

The Philippine Islands are the chief exporters of coconut oil, the bulk going to America. The trade there and in the Dutch Indies greatly expanded during and after the war. Great Britain draws chiefly on Ceylon, India and the Dutch East Indies. German and French imports are chiefly re-exports from other European countries.

Although most of the American supply of coconut oil originates from her tropical Colony—The Philippine Islands, this growing trade cannot be a matter of indifference to those interested in Malayan Coconut plantations. The Philippine Islands contain the second largest area of any country in the world, (Malaya takes sixth place, while as an exporter she is the fifth largest) and it is undoubtedly owing to this wealth, which was only fully appreciated during the edible oil shortage occasioned by the war, that American politics have aimed at stimulating the trade between the Philippine Islands and the United States of America.

The book also contains chapters of great interest, dealing with the margarine and soap industries; the market position and outlook of copra and coconut oil; besides "The Outlook for expansion with special reference to the Philippine Islands".

The writer seems less at home with her subject when dealing with questions of "Production and Preparation". True, it is pointed out that the book does not attempt to give more than a general survey of the cultural phases of the industry; but one cannot alienate such questions from that of economic production. The growing importance of estate production seems to be admitted, but no serious attempt is made to decide for instance, on the economic area to plant, although the subject is dismissed with arguments such as that contained on page 80:—

> "On the other hand, 2,500 acres is a good deal of land to be operated under a single management, especially as orchard".

Such a statement lacks precision, in addition to which there is no evidence advanced to prove that 2,500 acres is, or is not the economic unit. Again one reads

> "The former type of plantation (*i.e. small plantation*) has been most successfully developed in Ceylon; the latter (i.e. 'nothing short of tens of thousands of acres') not so successfully in the Malay States".

It is a little uncertain from the text as to whether the allusion is to rubber or coconut land, but in any case one feels certain that many large estates (although not actually 'tens of thousands of acres') in Malaya would be prepared to dispute this statement. The fact must be appreciated that the economic unit for a crop must depend upon the particular crop—compare tea, for instance, with coconuts or sugar cane. One would remind the Authoress of her own selected quotation:—

> ".....price in the end is the prime determinant of future growth. At present prices there is no reason to expect more than a moderate expansion, even in countries with ample room for development. There are probably other commodities offering larger returns although perhaps none where the long-time outlook is more secure".

and point out that cost of production is largely instrumental in determining the development of the industry, and considering the market value of the product in competition with substitutes.

It is probable that the Food Research Institute lacked facilities for the study of production. If such be the case, the discussion in the book on "Cultivation and Production", and parts of Chapter VII were better omitted, as they add nothing to the reader's knowledge on the subject.

The value of the book, however, should not be based on its shortcomings in the above respect. The available literature on the coconut industry is scanty, and the present volume condenses and renders available much valuable data and other information. The difficulties in collecting statistics on the coconut industry—extending to an area of six million acres, of which 90% is native owned—is very considerable. This difficulty and resultant unreliability is admitted by the

Authoress, and appreciated by the present Reviewer. The temptation of forcing deduction beyond the accuracy of the statistics is almost irresistible, but apart from one or two instances, has been successfully avoided in this book. The conclusions reached, in particular those stated in the chapter on "Market Position and Outlook", appear justified, and will encourage those who have placed their faith—and capital—in coconut plantations.

Plant Importation Rules of the Dutch East Indies.

The following abstracts should prove useful to those wishing to send plants or parts of plants to the Dutch East Indies.

GOVERNMENT GAZETTE OF THE DUTCH EAST INDIES
1926 No. 427.

PARAGRAPH I.

The importation into the Dutch East Indies of hevea-seeds, living hevea-plants and parts of living hevea-plants, from South America is prohibited.

PARAGRAPH II.

1. The importation into the Dutch East Indies of living plant material other than that referred to in Paragraph I, is—(without prejudice to the Rules laid down in Paragraphs IV & VII)—permitted only in the ports indicated for that purpose by the Director of Agriculture, Industry & Commerce and with due observance of the instructions given by the Head of that Department.

2. The ports indicated and the instructions given, referred to sub. 1 will be published in the "Javasche Courant" with the date at which these rules will come into force.

3. For the purposes of this Enactment living-plant material will be understood to mean: seeds, fresh fruits, living plants and parts of living plants.

PARAGRAPH III.

(refers to formalities subsequent to importation).

PARAGRAPH IV.

The Director of Agriculture, Industry & Commerce may:

a. on conditions, to be imposed by him, allow the importation into the Dutch East Indies of plant material, such as referred to in Paragraph II, in respect of which the Rules of this Enactment have not been observed.

b. (refers to formalities subsequent to importation).

Paragraphs V & VI.

(Refer to formalities subsequent to importation.)

Paragraph VII.

This Enactment does not apply to importation of:

a. living plant material for the importation of which specific rules have been made or will be made.

b. seeds obviously intended for consumption.

c. living plant material to be indicated* by the Director of Agriculture, Industry & Commerce.

Paragraph VIII.

This Enactment comes into force on the 15th of November, 1926.

8th October 1926.

The Secretary General

G. R. Erdbrink.

Decree of the Governor General

27th September 1926.

No. 26.

*meaning: "exempted"—? Translator.

Decree of the Director of Agriculture Industry and Commerce.

No. 9760/A. 2. 3 November, 1926.

with amendments to 8 June 1928.

The Director of Agriculture, Industry & Commerce has resolved:

.....

.....

I. to indicate as ports of importation for:

a. *Seeds, living plants and parts of living plants* Tandjoeng Priok & Medan (Belawan Deli).

b. *Fresh fruits.*

Tandjoeng Priok, Samarang, Soerabaia, Makassar, Medan (Belawan Deli), Palembang, Pankalpinang, Bengkalis, Pontianak and Samarinda.

c. *Tea-seeds.* Palembang and Padang.

II. (Refers to appointment of expert-examiners. sub. a).

III. (idem . sub. b).

IV. to indicate as living plant material exempt from the Rules of the Enactment of 27 September 1926— (Government Gazette No. 427).—

a. seeds of the following vegetables, herbs, fruits and medicinal plants:

Allium,	*Foeniculum,*	*Portulaca,*
Anethum,	*Fragaria,*	
Anthriscus,		*Raphanus,*
Asparagus,	*Lactuca,*	*Rheum,*
	Lavandula,	*Ribes,*
Basilicum,	*Lepidium,*	*Rosmarinus,*
Brassica,	*Leontodon,*	*Rubus,*
		Rumex,
Capsicum,	*Melissa,*	
Cichorium,	*Mentha,*	*Salvia,*
Cochlearia,		*Satureja,*
Coriandrum,	*Ocymum,*	*Scandix,*
Cynara,	*Origanum,*	*Scorzonera.*
		Sinapis,
Daucus,	*Pastinaca,*	*Sisymbrium,*

Solanum, *Spinacia*, *Taraxacum*, *Tetragonia*, *Thymus*, *Valerianella*.

b. seeds of plant species belonging to the following genera and species of ornamental plants:

Abutilon, *Acroclinium*, *Adonis*, *Ageratum*, *Agrostemma*, *Althaea*, *Alyssum*, *Amarantus*, *Amberboa*, *Ammobium*, *Anemone*, *Antigonon*, *Antirrhinum*, *Aquilegia*, *Arctotis*, *Aristolochia*, *Asparagus*, *Aster*, *Begonia*, *Bellis*, *Bidens*, *Boltonia*, *Boussingaultia*, *Buphthalmum*, *Cacalia*, *Calampelis*, *Calceolaria*, *Calendula*, *Campanula*, *Canna*, *Carduus*, *Celosia*, *Centaurea*, *Cheiranthus*, *Chrysanthemum*, *Cineraria*, *Clarkia*, *Clematis*, *Clerodendron*, *Cobaea*, *Coleus*, *Convolvulus*, *Coreopsis*, *Cosmea*, *Cosmidium*, *Cosmos*, *Cuphea*, *Cyclamen*, *Cynara*, *Cynoglossum*, *Dahlia*, *Delphinium*, *Dianthus*, *Digitalis*, *Dimorphotheca*, *Eccremocarpus*, *Eschscholtzia*, *Gaillardia*, *Gerardia*, *Gerbera*, *Gilia*, *Gloxinia*, *Gomphrena*, *Gypsophila*, *Helianthus*, *Helichrysum*, *Heliotropium*, *Hibiscus*, *Iberis*, *Impatiens*, *Inula*, *Ipomoea*, *Leptosiphon*, *Linaria*, *Linum*, *Lobelia*, *Lochnera*, *Lunaria*, *Lychnis*, *Matthiola*, *Matricaria*, *Maurandia*, *Medeola*, *Miana*, *Mimulus*, *Mina*, *Mirabilis*, *Myosotis*, *Nemesia*, *Nemophila*, *Nicotiana*, *Nigella*, *Nycterinia*, *Oenothera*, *Passiflora*, *Pelargonium*, *Pentstemon*, *Perilla*, *Petunia*, *Phacelia*, *Phlox*, *Physalis*, *Poinsettia*, *Portulaca*, *Potentilla*, *Primula*, *Pyrethrum*, *Quamoclit*, *Reseda*, *Rhodanthe*, *Ricinus*, *Rosa*, *Rudbeckia*, *Salpiglossis*, *Salvia*, *Sanvitalia*, *Saponaria*, *Scabiosa*, *Schizanthus*, *Senecio*, *Silene*, *Solanum*, *Stevia*, *Stokesia*, *Streptocarpus*, *Tagetes*, *Thunbergia*, *Tithonia*,

Torenia, *Verbena*, *Xeranthemum*,
Trachelium, *Vinca*,
Tritoma, *Viola*, *Zinnia*,
Tropacolum,

c. the following plants, if intended for consumption:

endive, beet, garlic, cabbage, lettuce, "obi", "petsai" (also called "paktsoi" or Chinese "sawai"), purslane, leek, spinach, "tekie", garden-cress, onions and sorrel.

d. Coconuts, the husk of which has been removed.

e. brood of edible mushrooms—(Agaricus)—

f. sugar-cane cuttings, imported into Tandjoeng Priok and Soerabaia for scientific purposes and addressed to the Director of the Experiment Station for the Java Sugar Industry at Pasoeroean.

V. to decree that with regard to the permitted importation of living plant material into the Dutch East Indies the following Rules will apply:

Paragraph I. Importation of the living plant material, referred to in paragraph II of the Enactment of 27 September 1926 (Government Gazette No. 427), is (without prejudice to the Rules given in the subsequent divisions of this paragraph) permitted only if accompanied by a certificate signed by an official of the Government of the country of origin or one of the Departments thereof and stating:

(the plant species to which the said material belongs (or from which it has been taken,

the quantity and weight thereof,

(that, at the moment of despatch, the said material (according to his conviction was free from animal or (vegetable enemies of cultivated plants

2—(refers to importation of potatoes from Europe, U.S.A. and Canada in connection with infection by Synchytrium endobioticum).

3—Without prejudice to the Rule given in the first division of this paragraph the importation of Hevea seeds, living Hevea plants and parts of living Hevea plants is permitted only if accompanied by a certificate, issued by a phytopathological institute in the

country of origin, stating that the trees from which this plant material was taken, are free from the South American leaf disease—("Fusicladium macrosporum" or "Passalora heveae")—and from Phytophthora leaf fall-disease and that on the estate or estates where the said trees have grown, no material has ever been imported from countries where these diseases occur.

4—(refers to importation of plants from China)—

5—(refers to importation of plants from Holland)—

PARAGRAPH II.

1. The plant material referred to in the preceding paragraph, is allowed to proceed to the addressee only after having, with the container in which it was imported, been examined by the expert referred to in points II & III and by him found to be free from animal or vegetable enemies of cultivated Plants. Or, if such is by him deemed to be possible, after it has been disinfected or in any other way has been freed from the organisms referred to.

2.—(refers to destruction of undesirable plant material by the examining expert.)

PARAGRAPHS III—VI.—(refer to formalities to be observed by addressee, instructions to examiners and customs-officers and fees payable subsequent to importation and exportation).—

PARAGRAPH VII.—(refers to local Institutions exempt from payment of fees).

PARAGRAPH VIII.—(refers to the forms to be used in the procedure of importation).

Paragraph I of this Decree comes into force on 15th November 1926 with the exception of the rules given in certain paragraphs.—(of no interest to us here. Translator)—which come into force on 15 February, 1927.